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ON THE COVER . . .

. . . Home lawn care has become a major recreational activity in America today. And as we become more urbanized, good care and use of the turf become more important. People take pride in their good lawns. No other feature adds as much beauty to home grounds.

You don't have to be an expert to grow a good lawn. But you do have to follow sound practices. In fact, the same principles of production and plant knowledge used on the nation's cultivated fields also apply to small lawns.

Look at the difference in the two plugs of turf on the cover, bottom. The plug on the left shows the effect of adequate nutrients, especially nitrogen. Healthy, dense, green, vigorous lawns don't just happen. They result from a sound lawn care program—including plenty of water, complete fertilization, and proper mowing.

On page 8, Dr. W. H. Daniel, Purdue University's recognized national authority on turf, reports some interesting facts on the fertility status of a large number of lawns. The conclusion, it seems, is that a high percentage of the lawn soils were low in potassium, requiring fertilizer high in this nutrient as well as nitrogen and phosphorus.

In developing a good lawn, USDA specialists say, you have to consider: "(1) Construction of the lawn—how it is graded and drained and how the seedbed is prepared; (2) selection of the grasses, and how and when they are planted; and (3) maintenance, which includes fertilizing, mowing, watering, and controlling weeds, diseases, and insects."

And the best way to maintain a good lawn, summing up official bulletins reaching *Better Crops* from across the nation, is to "fertilize annually, leave clippings on the lawn, rake leaves off in fall, mow regularly, set mower at least 1½ inches high, and control weeds with 2,4-D." *(Some disagree. Ed.)*

Better Crops with PLANT FOOD

The Whole Truth
Not Selected Truth

SANTFORD MARTIN, JR., *Editor*

Editorial Office:
1102 16th Street, N. W.
Washington 6, D. C.

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. . . pitch it, boy, pitch it

Better Crops with PLANT FOOD

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All hail to hard-working . . .

PEDAGOGUES OF THE PLOW

Jeff McDermid

(ELWOOD R. MCINTYRE)

Just 40 years ago (Feb. 17, 1917), our Congress passed a momentous law—the first government sanction of vocational training for American youth, including young farmers, on local, state, and federal levels. Its broad and well conceived pattern replaced the Ichabod Cranes and Hoosier Schoolmasters of the pioneers with legions of trained, dedicated professional pedagogues of the plow.

Two Georgia solons led the creation of this great educational renaissance—Senator Hoke Smith and Rep. Dudley M. Hughes. They overcame a few small doubts and put the compromise bill successfully through disagreement conferences between Senate and House.

"Agricultural education," said Section 10, "shall be less than college grade and be designed to meet the needs of persons over 14 who have entered upon or who are preparing to enter upon the work of the farm and the farm home." (Some school officers get headaches over this clause under our "new look" in agriculture.)

It provided some small temporary federal aid to states and localities on a matching basis. It set up a federal vocational board—the secretaries of agriculture and labor and the commissioner of education, plus three others named by the president, representing agriculture, labor and manufacturing.

Many good wishes and prophetic predictions came from the "godfathers" in Congress at the birth of this first vo-ag education law. Just two remarks, which enliven the yellowed pages of the *Congressional Record,* are worth exhuming from tombed archives to see how close we are today with yesterday:

Hon. Horace Towner, Iowa: "People will be glad when it is known that this act has passed, and notwithstanding the small appropriations, the beginnings will be of immense advantage in vocational education. We shall find that the states will multiply many times the sums which are today granted by the general government." *(In 1956, state and local budgets for vocational agriculture alone were over $42 millions against about $12 millions in federal aid, while 780,000 agricultural students were taking all-day, part-time, and evening courses.)*

Hon. Simeon Fess, Ohio: "Long before I came to this body, such educational legislation appealed to me. When asked by the President to go on his vocation committee to study the needs and possibilities of the vocational school project, I accepted the honor as being in a field of great good. I now congratulate this country that such legislation is here and that it has met with such universal approval from both houses of Congress."

"ONE OF THE STOUT SPOKES . . .

The prevailing theory is that agricultural education is mainly the responsibility of state and local governments; that it is a matter of national interest and welfare; and that federal funds are useful to stimulate and assist the states in making adequate provisions. It is now sustained by the original Smith-Hughes Act of 1917 and the modern version, the George-Barden Act of 1946. Moreover, agricultural education has other purposes—to encourage able young folks to take up vo-ag teaching as a career, to develop a new appreciation of the work among adults, and to interpret vo-ag teaching as an important profession, which it is and always will be.

But in the 40 years since less than 100 vo-ag teachers began their duties with misgivings, the whole rural-urban picture has changed. We must have better teachers and sounder methods to meet the shifting situation. Everywhere supervisors and teachers seem alert to this need and are preparing to grapple with it.

In my own state, early school history shows that the average teaching career lasted only 18 months, with the average time spent in one school being six months. Teaching in my youth was only a steppingstone to something better. Aside from the principalship, most positions paid about the same as unskilled labor. For the vast majority of teachers, it provided only temporary jobs.

But today the good vo-ag teacher is one of the stout spokes in the agricultural wheel of progress. He is a party to all community events and campaigns—economic, social, spiritual. He works beside the county agents, the merchant, the banker, the lawyer, the doctor, and the minister and the priest. As such, he is bound to become more secure and

serviceable to his dictrict. They want him to stay. In one Midwest state, 154 vo-ag instructors have been in the same school 5 years or more—10 of them for 20 years or more, 13 from 15 to 19 years, 52 from 10 to 14 years, and 79 from 5 to 9 years. Not since 1940 have there been over 5 percent of newly qualified vo-ag teachers who were not placed by October 1. In some years of that period, only one to 2 percent were still job-hunting by that date.

It takes cooperation with the school administrators and close acquaintance with the boys and their parents to meet and make the adjustments facing so many rural secondary schools. Here the good vo-ag teacher becomes a consecrated, friendly, reliable consultant, far beyond the role our teachers played in family affairs in the past.

Our family adviser has much to do as he travels out to farms. These days take much planning and hard thinking. A creeping form of urbanization eats at many a green countryside. More farmers each year must eke out their income off the land at skilled or common labor. Family farms are fewer, much larger, more highly mechanized. Youngsters who prefer farming are often frustrated by the overwhelming costs of land, equipment, and machinery. A majority of Iowa farmers said in a recent survey that they wanted their rural high schools to teach

. . . IN THE AGRICULTURAL WHEEL"

city skills and business methods to better prepare the large segment of boys and girls who must quit country living for metropolitan employment. By contrast, we hear from parents in the suburbs who insist that their lads get a taste of vocational agriculture so they'll get the feel of soils and the lore of the land. All such vexing, challenging questions make life a "happy burden" for the teacher in overalls. His day of destiny is just beginning.

Moreover, nowadays the ag instructor is a 12-month man as a rule. This gives him a stronger hold on his opportunities for service. A teacher's time is well spent during the summer months, especially when travel to farms is planned ahead and then reported to the school principal and the board. It's a thrill for a pupil to have his teacher drive out and hold a corn-row conference, with Dad participating.

As to certain strength-building factors for a vo-ag department, we went to an old friend—a time-tried, observant state leader who has done much for the cause of farming in over 30 years. What he tells me I pass on with confidence.

He says the vo-ag instructor is the core and foundation of a local department. He must not be afraid of hard work and long hours at a diversity of tasks not always in the curriculum. To reach his best abilities, he must earn the trust and cooperation of his staff associates and the principal.

Adequate modern facilities in shop, laboratory, and classroom are basic to the best results, although large, unused areas and good equipment left idle are no credit. He must rely upon farming programs as the basis of good teaching, such as the everyday problems of all-day class

members and other young farmers and adult farmers not attending school. This gives better personal contact with farm families—a tie-in which causes the vo-ag man to have closer business and friendly relations with farm families than any other school official usually maintains.

Contacts with farm organizations, livestock breed clubs, county extension people, and the local newspaper editor are sources of strength. Each advance made by the FFA chapter broadens and deepens the leadership training giving students a chance to enter activities and develop talents that fit them well for community service in later years. But a good teacher must evaluate the FFA doings. Money-raising stunts must be critically watched. When too many fund-raising activities are sponsored for trips and recreation, some merchants will naturally resent sales competing with local stores.

Good teachers *plan ahead* because it is poor practice to drift along with hardly a thought to the long-time objectives. Each teacher should plan a general department schedule at home and afield, so associates will know when either he or the pupils or both are going to be absent, and for what reason.

Supervised farming programs combined with on-the-farm instruction are the very backbone of vocational agriculture. The success of a good vo-ag program depends on both study and practice. Everything a boy does to develop his *managerial skill in farming* is part of his scholastic farming program. The program must also fit into the plans of the family —for family cooperation is essential. That brings us right back to the basic truth—"know your farm folks well."

All in all, the mainspring of the whole vo-ag machine is to hold farm and school in one related orbit. The best of our long-term teachers learned that long ago. They don't figure on swapping jobs with anybody while that same solid farm-and-school understanding keeps them feeling proud of their work and comfortable in it. If in doubt, go see for yourself!

YOUR APPLES

DO THEY GET ENOUGH BORON?

LACK of available boron in the soil may cause a reduction in growth and yield of apple trees, says James M. Beattie, of Ohio Agricultural Experiment Station.

Beattie points out that tests show a deficiency may exist even though there are no visual symptoms of a need for boron. Foliar analysis is the best method for telling when boron is deficient.

He advises growers to look for these symptoms of boron deficiency:

- **Dieback of terminal shoots and smaller branches.**
- **Yellowing of the leaf followed by death of leaf tips.**
- **External and internal "cork" symptoms of the fruit itself.**

When a boron deficiency is known to exist, growers should apply borax at the rate of ¾ pound per mature bearing tree every third year. Beattie states, however, that at some point before visual symptoms occur, a boron deficiency may have already affected tree growth and yields.

AMERICAN FRUIT GROWER

The following article reprints on profitable soil and crop management are available on request. Please indicate the reprint code and the number you desire. The address is: American Potash Institute, 1102 16th Street, N. W., Washington 6, D. C.

SOIL AND PLANT ANALYSIS

I-4-56 Surveying Corn Fields by Tissue Tests

L-5-56 Give Your Plants a Blood Test—Guide to Quick Tissue Tests

O-6-56 Plant Analysis As a Guide to Fertilization of Crops

Y-12-56 Leaf Analysis, A Potential Forestry Tool

E-2-57 Soil Testing Via County Laboratories

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MM-10-54 Longer Life for Ladino

S-4-55 Greener Pastures Mean Better Living

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M-5-57 Building Tomato Yields Through Deep-rooted Legumes and Fertilizer Treatment

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X-5-55 What Is Happening to Our Citrus Soils?

EE-10-55 Fertilizing for Better Apples

B-1-56 Certain Practices Are Important for Successful Pecan Production

SOILS AND FERTILIZER—GENERAL

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G-2-56 Plant-Food Content of Crops—Guide to Rotation Fertilization

H-3-56 The Application of Fertilizers in Irrigation Waters

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C-2-57 Potash Fertilizers & Their Behavior

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F-3-57 Sound Fertilizing Equals Economical Crop Production

H-3-57 Lime . . . Its Placement & Penetration in Soils

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B-1-57 High Yields—Fruit of Wise Land Management

G-3-57 A System for Recording Soil Fertility Data

N-5-57 Growing Azaleas and Camellias—Glory of Spring

• Turf usually grows satisfactorily in alkaline soil if the supplies of other nutrients, particularly potassium, are maintained at adequate levels.

• Irrigation of fairways can double nitrogen and potash needs, but have little effect on phosphorus needs.

• The urban user should apply on his lawn mixed goods that insure *maintenance levels of all nutrients* in each application.

• With the rapid growth in non-farm use of plant foods—up to 10% of the total goods produced in 1955—there is special need for reappraising the fertilizers offered for turf grass culture.

Soil Tests

PLANTS have a lower limit of nutrients they may contain and still appear healthy. This is called the *minimum*. Below this we see visual signs of *deficiency* on live plants —signs like yellowing, firing, dieback, etc. Above deficiency most plants have a *range of element content* which allows for, and is called, normal growth. If the uptake by roots of the plant is excessive, due usually to excess of a nutrient in the root zone, then we have *toxicity*.

Therefore, much of plant nutrition and fertilizer usage is an attempt (1) *to avoid deficiency,* (2) *to assure and maintain adequacy,* and (3) to prevent toxicity.

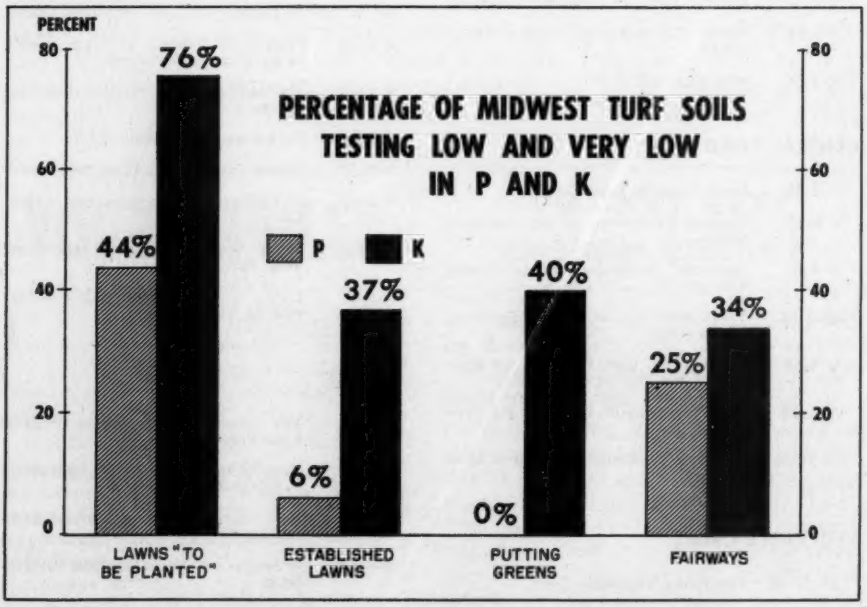


Fig. 1. Turf soils are generally much lower in potassium than in phosphorus.

Spotlight Turf Needs

Both plant tissue and soil tests have been developed and utilized to assay the soil supply, to predict utilization by the plant, and to provide a basis for adding nutrient elements. In this article, some needs of turf, as shown by a summary of soil tests, will be pointed out.

The Soil Testing Laboratory of Purdue University tested over 50,000 samples in 1956. This report covers only the 812 turf soil samples referred to the author's desk between 1952-1956, because of special questions asked or supplemental information needed. Since the laboratory accepts turf soil samples from midwestern states, this report covers general conditions of the Midwest.

We have been concerned whether some fungicides or herbicides being used would affect soil test results. A suspension of the fungicide Tersan (thiuram disulfide) equal to the total of a full season's application (about 5#/1,000 sq. ft.) had no effect on P or K tests. Also, Phenyl Mercury Acetate, PMA, had no effect on P or K tests. Arsenic gives a blue color test similar to phosphorus. However, the test is much less sensitive to arsenic. Heavy concentration of arsenic in some test samples gave only medium readings. Since the 369 putting green samples tested included greens with and without arsenic, depending on the insecticides used by the superintendent over the past ten years, the uniformity of excess levels indicated arsenic did not predominate over the phosphorus measured. Thus, it appears *the tests are measuring P and K accurately.*

A pH of 7.0 is neutral. On acid soil below a pH of 6.0 (which indicates 10 times more H ions present than at 7.0) lime applications are urgently needed and lime is usually suggested below pH 6.5. The pH is readily affected by the hard (calcium or magnesium carrying) irrigation water used in much of the Midwest. Therefore, many soil samples under turf show slightly alkaline (above a pH of 7.0). Turf usually grows satisfactorily in alkaline soil if the supplies of other nutrients, particularly potassium, are maintained at adequate levels.

By W. H. Daniel

Department of Agronomy

Purdue University

Dr. W. H. Daniel, native of Arkansas, is Professor of Agronomy at Purdue University. He received his advanced training at Michigan State. He is a recognized national authority on turf, who joined Purdue in 1950. He is now Turf Gross Specialist and Secretary-Treasurer of the Midwest Regional Turf Foundation.

Table 1.—pH of Midwest Turf Areas

below 6.0	6.1–6.4	6.5–7.0	7.1–7.4	7.5 above
%	%	%	%	%
369 Midwest Putting Green Soils (percentage in various ranges)				
3	6	35	43	13
9% might need lime		91% don't need lime		
84 Midwest Golf Course Fairway Soils				
27	16	30	21	6
43% might need lime				

Table 2.—pH of Midwest Lawn Soils (percentage in various ranges)

	below 6.0	6.0–7.0	7.1 above
	%	%	%
222 established	15	40	45
102 to be planted	40	35	25

Of the established lawns only 15% needed lime. On new lawns 40% needed lime, and this is best mixed into the soil at planting time. If possible, consult your agricultural leaders to get a soil test before devoting effort or funds to liming.

Phosphorus and Potassium Needs

Table 3.—Phosphorus and potassium in 121 "to be planted" lawn areas (percentage in various ranges)

Test	V. Low	Low	Medium	High	V. High	Excess
	%	%	%	%	%	%
Phosphorus	17	27	22	14	11	9
Potassium	31	45	11	9	4	—

Notice the need for both elements here is about equal. Since grass is most responsive to nitrogen, a 1:1:1 ratio of nutrients (for example, 12-12-12) is often desired for mixing into the root zone before planting grass seed.

Table 4.—Phosphorus and potassium in 205 established Midwest Lawn Soils (percentage in various ranges)

Test	V. Low	Low	Medium	High	V. High	Excess
	%	%	%	%	%	%
Phosphorus	1	5	10	9	21	54
Potassium	7	30	17	20	26	—

Of the established lawns only 6% might respond to additional phosphorus, but 37% would probably respond to potassium. With most irrigated lawns being alkaline, a higher amount of potassium is desired to balance the high calcium content. Therefore, potash needs for plant use and balance need additional attention.

Table 5.—Phosphorus and potassium in 369 Midwest Putting Green Soil Samples (percentage in various ranges)

Test	V. Low	Low	Medium	High	V. High	Excess
	%	%	%	%	%	%
Phosphorus	0	0	1	1	6	92
Potassium	9	31	30	17	13	—

How can 99% of the putting green soil have high to excess phosphorus? The potato growers of Maine, the fruit growers of Washington and tobacco growers also have, by repeated heavy application of complete fertilizers, accumulated high phosphorus levels in their soils.

Remember, fertilization was started as a supplement to natural soil content —and fertilizer manufacture was built around phosphorus acidulation. Therefore, there is a tendency to maintain high proportions of phosphorus in mixed goods. Nevertheless, since phosphorus is less subject to leaching and there is repeated fertilization of turf areas, very little phosphorus may be needed to maintain high availability levels.

Potassium, on the other hand, is easily leached by hard water used in irrigation. Nelson[2] points out frequent use of urea or ammonium sulfate, plus watering, replaces the potassium from the soil colloids. Heavy watering then leaches the potassium out of the root zone. Also, frequent clipping and removal of clippings cause a steady drain on nutrients, particularly nitrogen and potassium (Table 10).

Accordingly, on most irrigated Midwest turf areas more potash is needed. All putting greens tested have had some potash applied, yet 70% were medium or lower (Table 5). This shows applications were not enough to build up or maintain adequate levels.

Table 6.—Phosphorus and potassium in 81 Midwest Fairway Soil Samples (percentage in various ranges)

Test	V. Low	Low	Medium	High	V. High	Excess
	%	%	%	%	%	%
Phosphorus	2	23	14	11	14	36
Potash	9	25	15	24	27	—

In medium or lower levels the fairway tests for P and K are similar. Actually these tests represent two conditions—those fairways not fertilized in years and those high in both P and K due to adequate current fertilization. Irrigation of fairways should double nitrogen and potash needs, but have little effect on phosphorus needs.

What Other States Report

After compiling our results, a copy was forwarded to six other turf people having access to numerous soil test reports. They were asked to correlate this with their observations.

B. P. Robinson, Southeastern USGA Turfletter Vol. 2, No. 3, 1955 gives the following results on soil samples from golf clubs in the Southeast:

Table 7.—Soils on golf clubs needing phosphorus, potash and lime

	Phosphorus	Potassium	Lime
	%	%	%
Clay Soils in Piedmont			
Greens	5	65	15
Fairways	50	0	30
Sandy Soils of Coastal Plain			
Greens	5	70	25
Fairways	25	45	40

A. E. Cooper of Pennsylvania reports over 5,000 turf samples tested since 1950. Of 197 putting greens tested in 1954, 21% were medium or lower in phosphorus, and 89% were medium or lower in potassium (Table 8).

Table 8.—Phosphorus and potassium in 197 putting greens in Pennsylvania

	V. Low	Low	Medium	High	V. High
	%	%	%	%	%
Phosphorus	5	2	14	31	48
Potassium	11	60	18	5	6

H. L. Lantz of Iowa, letter of December 1956 reads, "On golf greens we invariably find phosphorus high on regularly fertilized putting greens. Iowa soils in most areas are deficient in phosphorus, but surprisingly enough, lawns and fairways seldom show a marked response when phosphorus is applied. Nitrogen always produces marked responses. . . ."

What Does Grass Actually Remove from Soil?

Noer[3] has assembled data on annual removal of nutrients from golf greens.

Table 9.—Annual removal of N, P_2O_5, and K_2O, and dry matter from golf putting greens (lbs. per 1,000 sq. ft.)

	Bentgrass	Bermudagrass	
	Milwaukee, Wis.	Memphis, Tenn.	Natal, Africa.
	lbs.	lbs.	lbs.
N	4.7	5.6	3.4
P_2O_5	1.7	1.5	0.1
K_2O	3.1	3.4	2.2
Dry Matter	97	120	109

The first two above received heavy fertilization; the third (Africa) received little fertilizer and had a very long growing season.

Who Supplies Turf Fertilizers?

In 1955, the Indiana Fertilizer regulation and testing service reported on manufacturers, formulators, or processors of fertilizer materials. Of the 150 reported, at least 50 produced a 1:1:1 material, such as 12-12-12. Only 5 produced a 2:1:1, six produced 3:2:1 (five of these were liquid), one produced 3:1:2, and one a 2:1:2.

Table 10.—High nitrogen ratio fertilizers produced by Indiana suppliers		
Number of Suppliers	N – P_2O_5 – K_2O	Comments
50	1 : 1 : 1	Such as 12–12–12
5	2 : 1 : 1	Such as 10–6–4
6	3 : 2 : 1	But 5 were liquids
1	3 : 1 : 2	Note higher potash
1	2 : 1 : 2	A soluble material

Certainly there is a need for more attention to adequate potash supply and the effects of phosphorus accumulation under turf conditions. Many companies have modernized plants to produce granular and pelleted forms. With uniform pelleting and granulation, ratios of 3:1:2, 4:1:2 and 2:1:1 can be packaged as special lawn-turf fertilizers for fast spreading on turf whenever leaves are not wet.

Table 11.—Average rates used on agricultural crops in Indiana in 1954[1]			
Crop	Plant Nutrients lbs./A/Season		
	N	P_2O_5	K_2O
Corn	22	38	42
Oats	13	40	40
Vegetables, potatoes	34	60	98
Putting greens, average	320	?	?
Lawns, well fed	160	?	?

Summary

Suggested Annual Ranges of actual nutrients for turf in Midwest (lbs. per 1,000 sq. ft.)		
Heavy Feeding	Location	Average Feeding
N P_2O_5 K_2O	Putting greens:	N P_2O_5 K_2O
10 – 2 – 5	Established	8 – 2 – 4
8 – 4 – 4	New construction	6 – 3 – 3
8 – 2 – 4	Irrigated lawns Tees and fairways	3 – 1 – 2
4 – 2 – 2	Lawn, unirrigated	2 – 1 – 1

Notice that the suggested rate of N is highest, P_2O_5 is only one half to one fourth of N, but K_2O is one half of N. Turf has a very widespread fibrous root system and we have very little evidence that turf actually, after establishment, needs high phosphorus supplies. Nevertheless, since turf can tolerate high phosphate, medium or above levels should be maintained.

From the urban user's standpoint, it is desired to have mixed goods which apply *maintenance levels of all nutrients* in each application. Fertilizers with an $N:P_2O_5:K_2O$ ratio of 4:1:2, or 2:1:1 would meet the majority of maintenance needs on turf. A 1:1:1 ratio fertilizer would fit many needs on establishment. Of course, soil tests are essential in determining the specific fertilizer and lime needs and should be made whenever possible.

There is tremendous increase in non-farm use of fertilizers (up to 10% of total goods produced in 1955). With this fast increasing non-farm use of nutrients, there is a special need for re-appraisal of the fertilizers offered for turfgrass culture.

New techniques and processes of formulation, new non-burning ingredients and easier distributing qualities make turf fertilizer a fast developing phase in an expanding market.

[1] Janssen, M. R. and Ohlrogge, A. J. Use of Fertilizer on Principal crops in Indiana, 1954. Mimeo ID-15, Purdue University, Lafayette, Indiana. March 1957.

[2] Nelson, W. L. Potash Important for Golf Greens. Proc. of Midwest Regional Turf Conference 1957.

[3] Noer, O. J. and J. E. Hammer. "The yield and chemical composition of clippings from a Bermudagrass green", presented in Turfgrass Section of A. S. Agronomy meetings, 1956.

◄◄◄

VALUABLE FARM TOOL

Aerial photographs can be a valuable farm tool.

C. E. Olson, Jr., research associate in forestry at the University of Illinois Dixon Springs Experiment Station, says an aerial photo is like a map of your farm, only much better.

From an aerial shot you can easily identify roads, trails, livestock tracks, woodlots, fencerows, windbreaks, shade trees, section and "forty" lines, old roadbeds, ponds, streams, drainage ditches, erosion areas, houses, barns and other buildings and many other things that you won't find on a conventional map.

Outlines of fields, pastures and orchards in an aerial picture can be very valuable, Olson says. And many times you can locate old survey lines, boundaries and tile lines that you can't see at all from the ground.

You can make a chart of your farm operations on a year-to-year basis simply by placing a piece of tracing paper over the aerial picture of your farm. Then you can trace field outlines accurately and keep a record of each field by crop use, planting and yields.

Most areas of Illinois and bordering states have been photographed from the air at least twice, once in the late 1930's and once since 1950. From copies of the two photos—if your farm has been pictured twice—you can easily compare changes in soil condition, land use and erosion inroads.

If you are interested in getting aerial photographs of your farm, see your county farm adviser, Soil Conservation Service representative or a state or federal forester. Any of them will be able to help you.

"23 inches tall" . . . such stands are possible with proper management and efficient fertilization.

WHY GROW ALFALFA?

FOR the past 12 years, now, North Carolina has gradually increased its acreage of alfalfa, growing from about 8,000 acres in 1944 to 84,000 in 1956. Considerable alfalfa was seeded last fall, and many fields are now showing the results.

The present 84,000 acres are scattered over the Upper Coastal Plain, Piedmont, and Mountains, which means that more and more farmers are seeing a successful "patch" of alfalfa nearby. This, plus the growing numbers of livestock, is causing farmers to think about alfalfa. A few farmers have 1 acre per cow and many others are planning to reach this goal as soon as possible.

While alfalfa is still primarily a hay crop in North Carolina, considerable silage is being made from it in the spring of the year. (We now have 3 alfalfa dehydration plants in the state.) Many farmers, especially dairymen, are using the two midsummer crops as supplementary grazing. Being a deep-rooted crop, alfalfa will hold longer into the dry periods than our Ladino clover and other permanent pasture plants and will out-produce them on the higher, dryer sites.

The cornerstones of a successful alfalfa program have been laid by a research program started 18 years ago. A greatly strengthened alfalfa breeding program is now underway, causing us to look to the future with hope and confidence.

The following sketches illustrate the posters and slide sets now being used in special alfalfa meetings to explain North Carolina's alfalfa program to Tar Heel farmers. They ask and answer the important question—Why Grow Alfalfa?

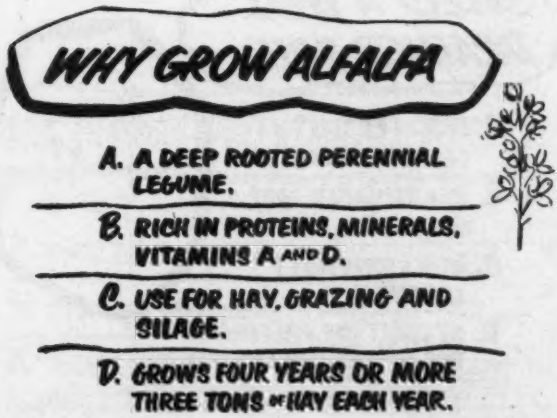
"Alfalfa comes at opportune time. It fits in on every farm, once the soil is made right. It is a permanent thing. It is a mine of riches, a magazine of rich provender, a source of fertility wherewith to build animals and to build soils.

"Alfalfa brings hope, courage and joy. It brings beauty to field and landscape. It covers over the scars made on the face of Nature, it stops the waste of erosion and soil leaching. Where it comes boys cease leaving the farm, bees come, and birds; . . . land values advance, paint comes to the schoolhouse and happy children trudge along the lanes with well-filled dinner pails."—Joseph E. Wing

By
S. H. Dobson, Agronomy Extension Specialist
W. W. Woodhouse, Jr., Professor of Soils
North Carolina State College

Dr. W. W. Woodhouse, Jr., a North Carolina native, is Professor of Soils at N. C. State College. He earned both his B.S. and M.S. degrees there, later earning his Ph.D. from Cornell. For the past 20 years, he has been conducting forage fertility research in North Carolina.

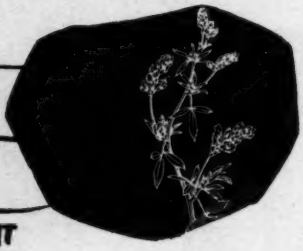
S. H. Dobson, a native North Carolinian, has served as Extension Specialist in Pastures and Forage Crops for the past 12 years at N. C. State College. His work has carried him into many counties and regions of the state with the latest findings on successful alfalfa production.


WHY GROW ALFALFA
1
A. A DEEP ROOTED PERENNIAL LEGUME.
B. RICH IN PROTEINS, MINERALS, VITAMINS A AND D.
C. USE FOR HAY, GRAZING AND SILAGE.
D. GROWS FOUR YEARS OR MORE THREE TONS OF HAY EACH YEAR.

Many fields of alfalfa have produced 2½ tons of hay per acre before the summer drought set in each of the last two dry years (1953-54). True, it stopped growth during the dry weather, but it held into the drought longer, and recovered as soon as the rains came. This, plus the increasing need for high quality feed, makes alfalfa a highly desirable plant.

HOW TO GROW ALFALFA

A. CAN BE GROWN SUCCESSFULLY.
B. EXACTING IN ITS REQUIREMENTS.
C. ALL DETAILS MUST BE TAKEN CARE OF.
D. SHOULD BE DONE RIGHT OR NOT AT ALL.



2

Like any good crop, alfalfa has its specific requirements. They are fairly well defined in the state now, at least, to the point where we feel that alfalfa can be grown on most any well-drained soil in the Upper Coastal Plain, Piedmont and Mountains. Again, there is no "half success" with alfalfa!

Others say . . .

Alfalfa has long been recognized as an outstanding hay plant, in terms of both yield and feeding matter . . . high in digestible protein, minerals, and vitamins. Because of its long life, it can be economically produced. It is of exceptional value in maintaining soil fertility. It helps control erosion, improves the physical condition of the soil, and accumulates large amounts of nitrogen (N).

(New Jersey Extension Bulletin 748)

SELECT A WELL DRAINED SOIL

A. GOOD FERTILITY LEVEL DESIRABLE.
B. REASONABLY FREE OF WEEDS.
C. CONVENIENTLY LOCATED.
D. AT LEAST ONE, PREFERABLY TWO YEARS BEHIND ANY CLOVER.

3

In selecting a soil for alfalfa, the first requirement is good drainage. It is preferable to have the other four factors. However, each of them can be overcome in part: the fertility level can be changed by adding lime and fertilizer; some of the weeds can be controlled chemically even in seedling alfalfa. With rubber mounted equipment, location is less important than formerly. The disease danger following clover or other alfalfa can be lessened by one year of row cropping.

PREPARE A GOOD SEEDBED

4

A. FIRM WELL PULVERIZED.

B. ORGANIC MATTER IN TOP LAYER OF SOIL.

To us, a good seedbed is one that is well pulverized, smooth and firm. Organic matter in the top layer, is especially important in establishment on our clay soils. It seems to help reduce crusting after heavy rains. (Helps hold seed in place.) Of course, we want the lime and extra phosphorus worked into the soil with the disking operations. The 2-12-12 fertilizer at seeding should be near the seed.

Others say . . .

Alalfa is the favored hay crop with (Tennessee) farmers because of its drouth tolerance and its large yields of highly nutritious hay. The fact it can usually be cut four times a season practically assures the farmer of hay in the barn, for even if he runs afoul inclement weather with one cutting he still has three chances to make hay.

(Tennessee Extension Bulletin 94)

LIME ACCORDING TO SOIL TEST

5

A. ONE TO 2½ TONS.

B. SPREAD UNIFORMLY.

C. WORK INTO SOIL BEFORE SEEDING.

A good percentage of our farmers are using a soil test as the basis of their liming and fertilization program on alfalfa. Poor job of spreading the materials, though, is still a source of many disappointments.

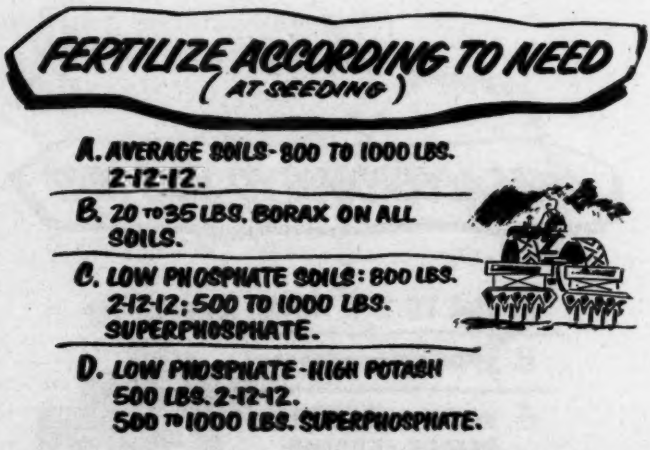
6

One point that cannot be over-emphasized is that of getting enough lime on and getting it worked into the soil. In this experiment, mixing the lime into the soil was worth a ton of *hay* per acre *extra* each year. We try to add enough lime at seeding to hold the alfalfa at least five years.

Others say . . .

Seeding alfalfa and other hay crops in wide row corn may be responsible during the next ten years for one of the greatest changes of the half century in our rotational system. Establishing alfalfa in corn will make it possible to keep our soil protected a greater share of the time, thus reducing or preventing soil erosion.

(A. E. Peterson, University of Wisconsin)


FERTILIZE ACCORDING TO NEED
(AT SEEDING)
A. AVERAGE SOILS - 800 TO 1000 LBS. 2-12-12.
B. 20 TO 35 LBS. BORAX ON ALL SOILS.
C. LOW PHOSPHATE SOILS: 800 LBS. 2-12-12; 500 TO 1000 LBS. SUPERPHOSPHATE.
D. LOW PHOSPHATE - HIGH POTASH 500 LBS. 2-12-12. 500 TO 1000 LBS. SUPERPHOSPHATE.

7

So far as growing alfalfa is concerned, most of our soils are also deficient in phosphorus, potassium and boron. We try to correct phosphorus deficiencies, before seeding, with fairly high rates. Some nitrogen is used to get the seedlings established and to hold them until they become inoculated. Our soils vary in their potash content and potash supplying capacity. Therefore, the need for supplemental potash varies. An attempt has been made to recognize these many variations in setting up general recommendations. Boron is recommended on all soils.

8

SEED ON TIME
A. LATE SUMMER & EARLY FALL.
B. USE 20-25 LBS. CERTIFIED ATLANTIC SEED.
C. INOCULATE SEED PROPERLY-MOISTEN WITH WATER & SYRUP.
D. SEED UNIFORMLY. COVER LIGHTLY (¼ INCH DEEP).
100 LBS NET
SEED

The Atlantic variety is now Number One on the recommended list and is quite popular in most parts of the state. Williamsburg and Oklahoma Common are also recommended. Buffalo is used in the mountains when wilt is present. We have lots of trouble getting good inoculation and are more successful when a mixture of syrup and water is used to moisten the seed. As to seeding methods, we like the cultipacker seeder, but any method that seeds uniformly and covers lightly is good. Experiments have shown that alfalfa seed covered 1" deep have a much poorer chance of germination and establishment, than those covered ¼".

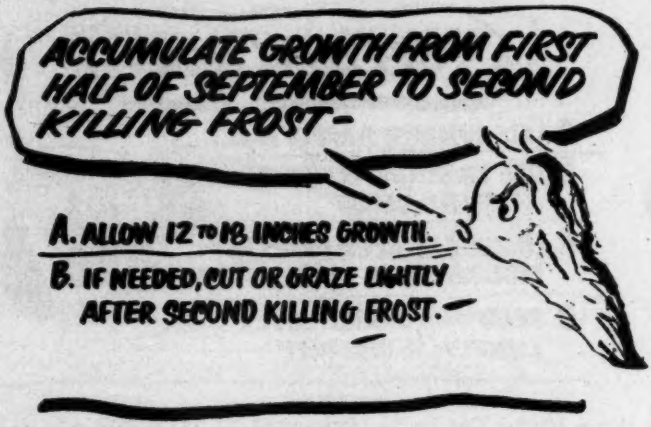
Others say . . .

Alfalfa is grown from the equator north to Alaska. No one variety or strain is perfectly adapted to such a wide range of climatic conditions. But there are enough varieties so that, among them, one or more may be found for almost any type of climate.

(University of California Circular 442)

9

Time of harvesting is important. If we wait too late, the stems get larger, the leaves become fewer and we clip part of the next crop. If we cut too early, the plants become weakened. We have had to add a third rule, especially for the 1st cutting—"Watch for the shedding of the bottom leaves." We have found that blooming has been delayed; and, that diseases have been knocking the new buds out during the damp spring season and they cannot get started until the old crop is cut, letting air and sunlight get to the crowns. This has caused many farmers to delay harvest 2 or 3 weeks beyond the optimum date.


ACCUMULATE GROWTH FROM FIRST HALF OF SEPTEMBER TO SECOND KILLING FROST -
A. ALLOW 12 TO 18 INCHES GROWTH.
B. IF NEEDED, CUT OR GRAZE LIGHTLY AFTER SECOND KILLING FROST.

10

Fall management is also important. If we cut or graze just before frost, quite often we lose as much as 4 lbs. of hay the next year for every one harvested at this time. However, after growth is stopped, this accumulated growth can be harvested without a net loss the next year.

Others say . . .

Alfalfa has many qualities which rate it of first importance as a forage crop in Canada. It has the ability to yield well and the high marketable value of the crop either directly as hay or indirectly through livestock ensures good yearly returns. Alfalfa hay when properly made and cured makes a valuable forage, because of its protein and mineral content. It is an excellent pasture crop in areas where trouble from bloating is not too serious. In common with other legumes it possesses the power to increase the nitrogen content of the soil.

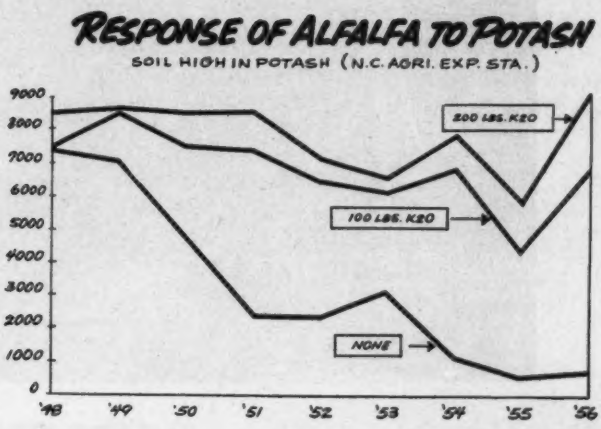
(Dominion of Canada Department of Agriculture Publication 735)

TOPDRESS EACH YEAR
(AFTER 1st YEAR)
A. LOW POTASH SOILS - 500-800 LBS. 0-9-27.
B. MEDIUM POTASH SOILS - 500-800 LBS. 0-10-20.
C. HIGH POTASH SOILS - 400-500 LBS. 0-20-20.

11

Annual topdressing of phosphate, potash, and boron is recommended. Before growth begins in the spring, or immediately after the first cutting, seems to be the best time to topdress. We are finding that after 2 or 3 years of alfalfa we have no high potash soils. Therefore, 0-9-27 and 0-10-20 are being pushed almost exclusively.

12



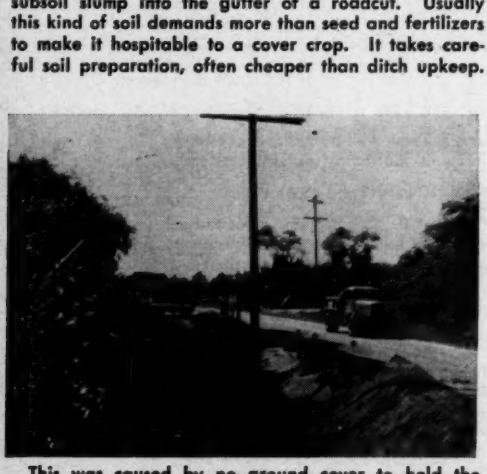
Once an alfalfa field is properly established, we are finding that proper topdressing is one of the keys to success. We try to replace the phosphate, boron, and most of the potash removed. Our farmers have observed and our Experiment Station has proved, that relatively high amounts of potash are needed. The above graph, taken from an experiment at the North Carolina Experiment Station, illustrates this point clearly. In 1956, this 9-year-old stand of alfalfa which had received 100 lbs. of K_2O produced nearly 3½ tons of hay, the 200 lbs. treatment produced four and one-half tons of hay per acre and has averaged 4 tons per acre for a total of 36 tons from one seeding. During the past nine years, treatments receiving less than these two rates of potash, have fallen by the wayside. The treatment receiving 400 lbs. of K_2O annually produced 10,254 lbs. of hay in 1956. Unquestionably, this explains many of our "thinning out" problems. To be sure, all the necessary fertilizer materials must be present before any one can be properly used.

FOR BETTER ALFALFA YIELDS . . .

- Select a well-drained soil of good fertility, fairly free of weeds and conveniently located.
- Apply lime on the basis of a soil test. Spread uniformly and work into soil before seeding.
- Fertilize with 700 to 1,000 pounds 2-12-12 and 20 to 35 pounds of agricultural borax at seeding. (Regular alfalfa fertilizer contains 3-4 lbs. borax per 100 lbs.).
- Prepare a firm, well-pulverized seedbed with organic matter in top layer of soil.
- Seed 20 to 25 pounds inoculated Atlantic, Williamsburg, or Oklahoma Common seed per acre in late summer. (Use Buffalo on wilt infested soils.) Cover lightly ¼" deep.
- Cut in early bloom stage. Allow hay to wilt in the swath, but rake into windrows before leaves become brittle.
- Manage properly by top-dressing annually after first year's growth with 500 to 800 pounds 0-9-27, 0-10-20 or 0-14-14 containing 15 to 25 pounds of borax.

Above, a spreader blows asphalt-treated straw to form protective mulch for a newly seeded roadside bed until the seeds sprout and establish themselves. The bed was previously fertilized and seeded with the same machine.

Here a faulty cover crop lets light plastic clay subsoil slump into the gutter of a roadcut. Usually this kind of soil demands more than seed and fertilizers to make it hospitable to a cover crop. It takes careful soil preparation, often cheaper than ditch upkeep.



This was caused by no ground cover to hold the ditch and shoulder. The results: hazard to motorists, expensive repair, several days work with a power shovel, a bulldozer, six trucks moving dirt, several workmen. Good tough, healthy cover prevents such washouts.

RO

A new br d o
tion's latest ad
interstate and efen
years at a cost o som

Agriculture's job, accord
determine the best vegetati
challenging job—of tilling,
old subsoils and freshly cut hill
will control erosion, keep oad
motorists, prevent 100 per cen wa
highways and adjacent farmland.

Several grasses and legumes have been
way ground cover—in the Southeast, s
kudzu for steep slopes, annual lespede a fo
muda, carpet grass, and some Bahia; in the
muda, curly mesquite grass, some love gr ss, b
buffel; in the West, crested wheat grass, s ooth
love grass; in the Northwest and Northeast, tal fesc
brome, bluegrass, rye, redtop, timothy, red fe cue,
grass, vetch, some alfalfa, and rye, oats, millet for quick
in the sandy Coastlands of both coasts, American and Euro
beach grass.

At right, a bank once covered with vegetation loses ground and erodes because the crop was "not kept in vigorous growing condition with fertilizer." Expense of six-man cleaning crew with truck could have been saved by timely fertilization, costing little.

ROADSIDE AGRICULTURE

y bra d of agriculture, *roadside cover*, will serve the na- est r ad building program—a 41,000-mile network of and d efense roadways to be completed in about 15 st o some $33 billion.

ob, according to USDA Research Center, is to t vegetative cover for the rights-of-way. It's a f tilling, fertilizing, seeding, mulching age- ly cu hillsides into tough-cover crops that eep oad shoulders firm and safe for r cen water runoff from washing out land.

ave been found suitable for high- ther t, sericea lespedeza and bede a for quick cover, Ber- a; in the Southwest, Ber- e gr s, blue panic and , s ooth brome, and , tal fescue, smooth l fe cue, orchard for quick cover; and European

USDA Photographs

Here seed-bearing sericea lespedeza hay was broadcast on a roadside cut: (1) to provide mulch against winter washing, (2) to form a tough cover when its seed takes root in spring, (3) to make welcome organic matter through decayed hay. It was applied at 4 tons an acre.

Banks too steep to mow, like these, can be held by deep-rooted kudzu, if started and maintained right. This was planted in rows with a slit of fertilizer about 6 inches away. Specialists strongly emphasize choosing an adapted species and maintaining it properly.

Sam Neville's Coastal Bermuda is fertilized with 120 pounds of nitrogen per acre along with 500 to 600 pounds of 6-12-12 each year.

Georgia Grazing System And Feed Production Program

SPONSORED BY OVER 300 FERTILIZER PEOPLE WHO FORESEE A SOUND AGRICULTURE BUILT ON ABUNDANT FORAGE FOR A GROWING LIVESTOCK INDUSTRY

FERTILIZER people in Georgia foresee a trend toward more grassland farming and less row cropping. Government restrictions on cotton, peanut and tobacco acreages seriously affect the prospects for maintaining the amount of fertilizer used under these crops.

To point the way, the Georgia Plant Food Educational Society, Inc. is sponsoring the Georgia Grazing System and Feed Production Contest. This organization of more than 300 fertilizer people envisions a profitable, sound agriculture built on abundant forage for a growing livestock industry.

The pasture contest is conducted by the University of Georgia Agricultural Extension Service, College of Agriculture. Fertilizer people serve on the County, District, and State judging teams.

To observe the progress, Extension fertilizer tours and meetings are held on winning farms to study grazing programs with emphasis on fertilizer and lime practices. The Plant Food Society sponsors these meetings.

The winning farmer in 1957 is Sam Neville, dairy farmer of Bulloch County. Mr. Neville was top man among 187 farmers from 61 counties who received recognition awards from the Georgia Plant Food Educational Society and the Agricultural Extension Service for doing superior jobs in pasture and feed production.

Water and nitrogen keep production high. Farm ponds occupy 100 acres of Sam Neville's farm for irrigation purposes.

By J. R. Johnson

Extension Agronomist **University of Georgia**

When better fertilizer practices are developed, Neville will be the first to put them in operation, according to county agent, Byron Dyer.

Mr. Neville bases his program on 227 acres of Coastal Bermuda grass. The two limiting factors with this plant are fertilizer and water. He has 100 acres in farm ponds for irrigation purposes. Each year he applies 500 to 600 pounds of 6-12-12 and 125 pounds of nitrogen to the Coastal Bermuda. Adequate water is supplied to keep the Coastal hustling. Sam Neville calls Coastal Bermuda "a wonderful plant."

To provide summer supplemental grazing that will keep the milk flowing, Mr. Neville plants 60 acres of Starr millet on three staggered dates. Here he applies 500 pounds of 4-12-12 fertilizer and 125 pounds of nitrogen per acre.

This man farms his land as intensely as any small acreage farmer must. He grows oats on almost all of his Coastal for winter grazing. He has 90 acres of oats and rye grass. How does he fertilize his winter grazing? Again with 500 pounds of 4-12-12 and 125 pounds of nitrogen per acre.

For dry cows and heifers, he uses frosted Bermuda in fall and winter grazing, and some soybeans for fall grazing. He cut 150 tons of Coastal Bermuda for winter feeding.

This farm has .62 acre of summer pastures per animal unit, .69 acre of winter grazing per animal unit.

Fertilizer people, county agents, and farmers visited Sam Neville's farm in July to take a tour and to make awards to other contestants in

the Grazing System. And when they were through, they all agreed this was a real demonstration of the new Georgia—and how it is paying off. Neville's daughter has graduated from college; Sam Jr. is now enrolled in college.

During July, the Georgia Plant Food Society sponsored four regional meetings over the state to tour and inspect top grazing and feed production farms. And on these tours, fertilizer manufacturers, dealers, and material men rubbed elbows with county agents, research workers, and farmers. Certificates of recognition were presented to 187 farmers from 61 counties who have done superior jobs of establishing and maintaining good forage and feed programs.

Home Demonstration Clubs prepared tasty meals. And Director W. A. Sutton and Dean C. C. Murray made the awards.

Buck Appleton is President of the Georgia organization and J. Fielding Reed is Secretary-Treasurer. These two men provide fine leadership for a real fertilizer and lime program in the state. ◄◄◄

PASTEURIZED SOIL

You've heard of pasteurized milk. Well, Washington State College scientists are now working on pasteurizing soil.

As with pasteurizing milk, the research men are trying to find a way to kill any harmful fungi that might cause disease in the soil. Drs. Maksis Eglitis (Egg-*glee*-tis), Folke Johnson, and E. P. Breakey, Jr., of WSC's western Washington experiment station, *Puyallup*, have been attempting this with high frequency radio waves.

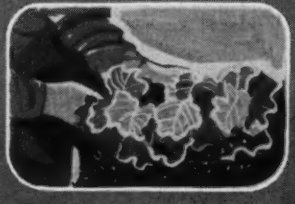
They've gotten very encouraging results against a soil-borne disease called seedling damping-off. What they did was fill wooden greenhouse flats with soil heavily contaminated with the disease. These flats were exposed to high frequency radio waves. Then crimson clover was planted in each flat.

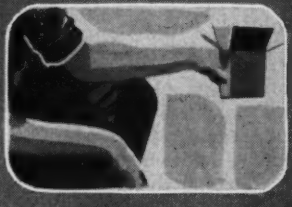
How much of the clover came up was the test of how well the high frequency energy had pasteurized the soil as far as this disease was concerned. In most instances, damping-off was controlled after a 5-minute exposure to the radio waves. This was true with samples of both Sultan and Puyallup silty loam soils—two types quite common in western Washington. The scientists got over three times the stand of clover in the treated flats that they did in the untreated diseased ones.

These preliminary experiments show the possibilities of this tool for agriculture of the future, the scientists say. Maybe someday machines will be developed that will be able to sterilize entire farms or fields this way and so reduce the disease hazard to the health of plants and animals.

API

Free
EDUCATIONAL FILMS





SCHEDULED ON REQUEST

Film Loan Service

The following picture services are available for loan from the American Potash Institute in Washington. Please write well in advance of the date the film is needed—giving your group's name, date of exhibition, and period of loan.

FILMS—16MM

POTASH PRODUCTION IN AMERICA (25 min.)

Featuring location, formation of American potash deposits . . . Mining and refining potash in California and New Mexico.

SAVE THAT SOIL (25 min.)

Depicting early South, showing results of one-crop-system . . . reclamation and conservation of southern soils through legumes . . . and modern soil management.

THE PLANT SPEAKS (Series of 4 films)

Through Deficiency Symptoms—showing soil depletion, erosion, results of plant food losses . . . deficiency symptoms in field and orchard crops. (25 min.)

Through Soil Tests—showing where, how to take soil samples, on the farm . . . value of soil tests when interpreted by experienced soil chemists. (10 min.)

Through Tissue Tests—showing value of tissue testing . . . procedure for testing corn tissues in field with Purdue field test kit. (14 min.)

Through Leaf Analysis—showing use of leaf analysis in determining the fertilizer crops need . . . how leaves are sampled and analyzed. (18 min.)

BORAX FROM DESERT TO FARM (25 min.)

California desert scenes where borax is produced . . . showing importance of borax in agriculture . . . with boron deficiency symptoms in olives, celery, cauliflower, crimson clover, alfalfa, sweet potatoes, table beets, radishes, apples.

IN THE CLOVER (22 min.)

Showing value, uses, culture, fertilizer requirements of ladino clover in North American agriculture.

SLIDE SETS

For Sale. For loan: ten days. Scripts included with sets. Available as film strips, also.

SUCCESSFUL ALFALFA

Featuring steps necessary to grow alfalfa successfully . . . and profitably. ($4.00)

SOIL FERTILITY & SOYBEANS

New concepts of producing soybeans, covering all phases of production. ($4.20)

POTASSIUM HUNGER SIGNS

Deficiency symptoms on our major crops and effects of potassium hunger. ($2.20)

POTASH PRODUCTION

Vivid slides on mining and refining processes used by the potash industry. ($6.00)

POTASH AND SOAP ASHES

Early Jamestown Commodities

To modern chemists, the methods by which early Jamestown settlers produced these two commodities may be primitive—but very interesting, as described from ancient records by the museum curator of the Colonial National Historical Park.

By J. Paul Hudson **Jamestown, Virginia**

One reason Jamestown, Virginia, was settled in 1607 was to search for certain commodities and raw materials needed by the mother country. At that time England was paying exorbitant prices to several European countries for such items as wine, cordage, timber and naval supplies, silk, glass, iron ore, potash, soap ashes, and numerous other goods.

Officials of the Virginia Company in London hoped the Jamestown colonists would be able to find many raw materials that could be shipped to England, sold cheaply, and at the same time make profits for the Company.

Potash and soap ashes—needed for making soap and glass during the seventeenth century—were both made by the colonists in the wilderness settlement. As potash was made from soap ashes, the two names (spelled in many ways, such as "pott-ash", "pot-ash", "pott ashe", "soape-ashes", "sope-ashes", etc.) were often used synonymously. Soap ashes were the ashes made from burning certain woods; and from these ashes both potash and soap were made.

J. Paul Hudson, an authority on American colonial craftsmen, is Museum Curator for the National Park Service. Under his care are the government museums at Jamestown and Yorktown. Author of many articles and booklets of 17th century colonial craftsmen, he earned his B.S. and M.S. degrees from Stanford University.

What is potash?

Pure potash is a white solid material, known to the chemist as potassium carbonate. To the Jamestown colonist, potash was a bitter-tasting alkali substance obtained by leaching wood ashes, evaporating the resultant lye solution (usually in iron pots), and calcining the residue.

The material made by the colonist—working with crude tools in an unfamiliar wilderness—was not a pure white solid material, but a crude lumpy substance, colored and very impure.

Making potash at Jamestown, 1608-1609

Potash was made at Jamestown as early as 1608, for in November of that year Captain Christopher Newport carried trials of soap ashes to England, as reported by Capt. John Smith:

". . . I followed the new begun

Conjectural painting by Sidney E. King

During the 17th century, magnificent specimens of hardwood trees grew in Virginia. Soap ashes and potash, made from the wood ashes of these trees, were made at Jamestown as early as 1608—being among the first commodities produced in America by the English. A liquid soap was made from soap ashes, whereas potash was used for making glass, a product first manufactured at Jamestown during the autumn of 1608. The conjectural illustration shows men making potash and soap ashes at Glasshouse Point, one mile upriver from Jamestown, during the latter part of 1608. The glasshouse is shown in the background.

> **workes of Pitch and Tarre, Glasse, Sope-ashes, and Clapboord; whereof some small quantities we have sent you."**

Smith also mentions the 1608 shipment in his *Generall Historie,* published in 1624. Writing of November, 1608, he states:

> **"Captaine *Newport* being dispatched, with the tryals of Pitch, Tarre, Glass, Frankincense, Sope ashes; with that Clapboord and Waynscot that could be provided: met with Master *Scrivener* at Poynt *Comfort,* and so returned to *England.*"**

Among the settlers who reached Jamestown in October, 1608 (with the second supply) were eight Dutchmen and Poles, sent by the Virginia Company to make pitch and tar, glass, and potash. Captain Smith believed the time was not opportune for the manufacture of such items, especially at a period when the food supply at Jamestown was running low, and he commented on the matter in very frank language:

> **"As for the hiring of the Poles and Dutch, to make pitch and tarre, glasse, milles, and sope-ashes; was most necessarie and well. But to send them and seaventy [70] more without victuall, to worke, was not so well considered; yet this could not have hurt us, had they bin 200.; though then we were 130 that wanted for our selves. For we had the Salvages [Indians] in that Decorum, (their harvest beeing newly gathered) that we feared not to get victual sufficient, had we bin 500."**

How much potash the Poles and Dutchmen made in 1608 is not known, but the records indicate they made trials of glass at Jamestown; and before they could make glass they would have to make some potash—an important ingredient in the manufacture of glass.

So the colonists not only made potash during the second year of the Jamestown settlement, but also optimistically predicted many other commodities could be produced. Gabriel Archer, a member of the first group of colonists, wrote:

> **"We can, by our industry and plantation of commodious merchandise, make oils, wines, soap-ashes; extract from the mineral-earth iron, copper, &c. . ."**

In 1610 a pamphlet entitled: *A True Declaration of the estate of the Colonie*

in Virginia . . . published in London "by advise and direction of the Councell of Virginia," commented on the abundance of wood in the Virginia colony for making potash and soap ashes:

> **"the country [Virginia] yeeldeth abundance of wood, as Oake, Wainscot, Walnut trees, Bay trees, Ashe, Sarsafrase, live Oake, greene all the yeare, Cedar and Firre; which are the materials, of soape ashes, and pot ashes, of oyles of walnuts, and bayes, of pitch and tarre, of Clap boards, Pipe-staves, Masts and excellent boardes. . ."**

Writing in 1612, William Strachey, who arrived at Jamestown two years earlier, listed the following commodities which could be found "within 100 myles" of "Iames-towne": "Planckes, Masts, pitch and tarre, Soape-ashes, Turpentine, Iron, Cordage, Mulberry-trees for silke, and another kind of Silke of the Grasse, Saxafras, and other aromaticall druggs, Gums, Oyle, and dyes . . . all these are to be had either ready provided by nature, or ells to be prepared were there but industrious men to labour . . ."

In the same account, Strachey mentions that large elms and ash made better soap ashes than small ones:

> **"There is also Elme and Ash of which are made Soap-ashes: yf the trees be very great, the Ashes wilbe very good, and melt to hard lumps being carefully burned, but if they be smale [small], and suffred to partake too much of the smoak, they wilbe but Powder, nothing so good as the other, besyde they wilbe very fowle and black."**

John Rolfe, writing in 1616, informs us that potash was being made at Bermuda Hundred—a settlement located on the James River about 30 miles west of Jamestown:

> ***"At Bermuda Nether Hundred* . . . are 119 . . . The houses and dwellinges of the people are sett round about by the ryver, and all along the pale so farr distant one from the other, that upon anie *All-arme* they can second and succor one the other. These people are injoyned by a Charter . . . to effect and performe such duties and services, whereunto they are bound for a certeyne tyme, before they have their freedom . . . Others . . . labor generally for the *Colony*,**

"A pile of firewood (billet-wood) is burned until grey ashes are formed. The timber may be felled at any season, the best varieties being oak, ash, poplar, hickory, elm, hazel, beech."

"After several pounds of ashes have been made, they are leached (boiling water is percolated through the ashes), causing a strong alkali solution known as ley (lye)."

amongst whom, some make pitch and Tarr, *Pott-ashes, Chark-coale,* and other workes. . ."

Our informer is the same John Rolfe who married Pocahontas in 1614, and who, in 1612, experimented with tobacco seeds from Virginia, the West Indies, and South America. As a result of his experiments, a sweet-scented tobacco leaf was developed which became the economic salvation of the infant Colony.

On July 24, 1621, the Virginia Company of London sent instructions to the Governor and Council of State in Virginia, relating to the affairs of the Colony. Item number 23 stressed the great need for salt, pitch and tar, and soap ashes:

"23 Item Salt Piche and Tarr, Soape Ashes &c. often recomended and sett up, and for wch fittinge men & Matterialls have been sent to the great Charge of the compa[ny] and yett daylie complaints come to us of the want of them wee desier you will now prosecute and further wth all dilligence & Care."

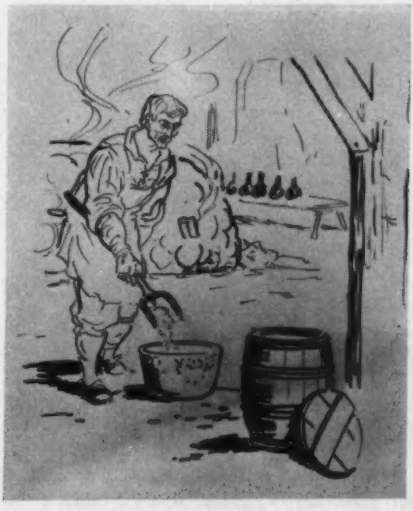
In January, 1621-22 the council in Virginia at "James Cyttie" sent a letter to the Virginia Company of London, reporting on the affairs of the Colony. An encouraging comment was made regarding potash: "Sope Ashes and P[otash] heer after prove a good Commoditie . . ."

Throughout the seventeenth century many Virginia colonists wrote tracts and pamphlets extolling the material wealth of the New World settlements. In most instances, the abundance of natural resources and the fertility of the soil were mentioned, and potash and soap ashes were usually listed with the other goods and commodities.

Edward William's pamphlet, *Virginia: More especially the South part thereof, Richly and truly valued* (published in London in 1650) is typical of many tracts. His thesis was that if more English men and women would emigrate to Virginia, the "Adventurers and Planters" alike would make more profits.

Williams called Virginia a land of plenty, abounding with "Timber, Cordage, Sailes, Iron . . . Wheat, Rice, Coleseed, Rapeseed, Flax, Cotton, Salt, Potashes, Sope-ashes, sugars, Wines, Silke, Olives, and what ever single is the staple of other Nations, shall be found in this joyntly collected."

"The alkali solution or ley is strained through a coarse linen cloth, to keep out any coarse materials such as the small pieces of half-burnt wood."



"The residue in the bottom of the pot or pan is removed and put into an iron pot, which is put over a strong fire till the matter is melted."

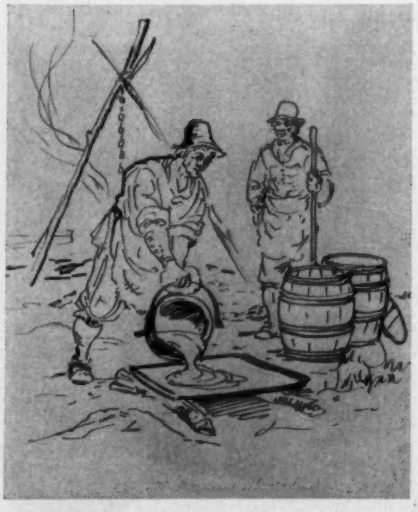
He emphasized the clearing of the woods in Virginia would not only make farm land available but would produce vast quantities of firewood which could be used for making potash:

> **"1. If wee consider the benefit of Pot-ashes growne from ten to fifty pound the Tunne, within these twenty years, and in all probability likely to encrease by reason of interdicting Trade betwixt us and the Muscovite, from whence we used to supply our selves; We shall finde the employment of that very Staple will raise a considerable summe of Money, and no man so imployed can (if industrious) make his labour less than one hundred pound, *per annum:* For if wee consider that those who labour about this in England give twelve pence the bushell for Ashes, if we consider to how many severall parts of the Countrey they are compelled to send man and horse before they can procure any quantity to fall to worke upon; if wee consider some of the thriftiest, and wise, and understanding men, fell Wood on purpose for this Commodity, and yet not withstanding this Brigade of difficulties finde their Adventures and Labours answered with a large returne of profit, wee who have all these things at our owne doore without cost, may with a confidence grounded upon reason expect an advantage much greater, and clearer profit."**

When Governor William Berkeley returned to Virginia in 1662 he was under orders (from the Privy Council) to encourage the Virginia colonists "to build a town on each river and to afford every possible encouragement to the production of silk, flax, hemp, pitch, potash, and other promising staples."

The English government attempted to discourage the overproduction of tobacco, for the growing of this crop took up a great deal of a planter's time; and during certain months of the year tobacco cultivation left few days for producing other commodities and staples. Contemporary records do not indicate how much potash was produced in Virginia during this period.

No contemporary records telling us how potash was made at Jamestown during the seventeenth century have



"Immediately the melted matter is poured out upon an iron plate, where it soon cools and appears in the form of a solid lump of potash."

"Making soap at Jamestown—usually a home industry undertaken by the Jamestown woman. She stirred calcined oyster shell lime and potash together in water, adding animal fats and cooking over a low fire . . . until the solution was 'boiled off', cooled, and put in casks."

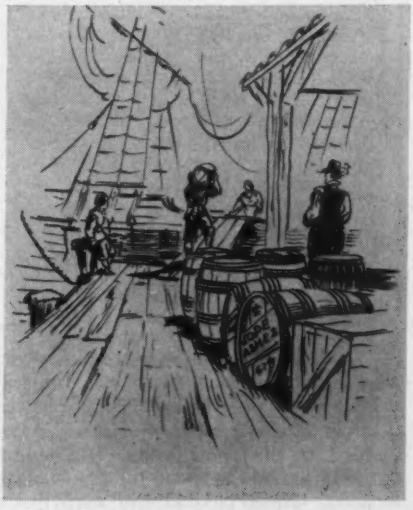
been found. It may be inferred, however, that it was made in the same manner followed in England.

1. **A pile of firewood (billet-wood) is burned until grey ashes are formed. The timber may be felled at any season, the best varieties being oak, ash, poplar, hickory, elm, hazel, and beech. Old hollow trees, if not dead, are desirable. Pine, cypress, and cedar should not be used.**
2. **After several pounds of ashes have been made they are leached (boiling water is percolated through the ashes), resulting in a very strong alkali solution known as ley (lye).**
3. **The alkali solution or ley is strained through a coarse linen cloth, to keep out any coarse materials such as the small pieces of half-burnt wood that might happen to remain in the ashes.**
4. **The strained ley solution is poured in an iron pot or pan, and evaporated over a quick fire —almost to dryness.**
5. **The residue remaining in the bottom of the pot (or pan) is removed and put into an iron pot. The pot is put over a strong fire till the matter is melted. Immediately the melted matter is poured out upon an iron plate, where it soon cools, and appears in the form of a solid lump of potash.**

To a chemist, these somewhat primitive methods are very obvious ones in making an impure form of potash. Combustion of hardwoods causes an ash residue containing the desired potassium carbonate. Some purification is obtained by leaching the ash residue in boiling water and then filtering this "ley" through a coarse linen cloth. The filtered ley is evaporated in an iron pot to dryness. The resulting potash is now ready for use in making soap and glass.

Undoubtedly most of the potash made at Jamestown during the early years of the settlement was shipped to England. But some was made for local use—first, for making soap, and secondly, for making glass.

"Making glass at Jamestown. The better the glass the more pains taken in securing a pure form of potash. An even more common practice in making green glass was to use ashes directly, omitting the leaching operation."



"Loading potash and soap ashes aboard a ship—for exporting to England. As early as 1621 soap ashes were selling for 6 to 8 shillings per 100 weight, while potash was bringing between 35 to 40 shillings per 100 weight."

Soap was a home industry, usually undertaken by the Jamestown woman forced to make a variety of products in a wilderness community. Jamestown was largely a self-sufficient settlement, and in most instances when a product was needed the colonists had to make it. Soap was rarely imported; it was made in a large copper kettle usually out-of-doors near a settler's home.

It was made in London as early as 1524. It must have been a fairly common item by the first decade of the seventeenth century. Perhaps it was made in the following manner at Jamestown:

a. Calcined oyster shell lime (oyster shells were obtained from the James River) and potash were stirred together in water, usually in a copper kettle. A strong potash "ley" resulted. (What takes place chemically is that the potash, potassium carbonate, is changed into potassium hydroxide.)

b. Animal fats (tallow, hog lard, etc.) were added to the "potash ley," and the resultant solution was cooked over a low fire (in a copper or iron kettle), and agitated until a syrupy mass was formed. Infrequently olive oil was added to the slow-boiling syrupy mass. When this occurred the fire was damped or stopped, while the ingredients in the kettle united. After they had united the fire was fed and the solution boiled again, being fed or filled with "potash ley" as it boiled, until the kettle was almost filled.

c. After the proper amounts of animal fats, oil, and "potash ley" had been poured in the kettle, the solution was "boiled off," allowed to cool, and put into casks.

The soap thus made at Jamestown was of a syrupy consistency, probably yellow in color. Some of the planters possibly mixed a small amount of indigo (added to the "potash ley" and animal fat solution at the end of the boiling period), which colored the soap green.

Glass was made at Jamestown in 1608-09, and again in 1621-24, according to contemporary records. To make glass the colonists had to make potash, and there is every reason to believe that it was made at Jamestown. J. C. Harrington, in his excellent booklet on *Glass-making at Jamestown,* comments on the matter as follows:

"Glass is composed largely of silica, which occurs most commonly in nature as sand . . . Other ingredients must be added to facilitate melting, to make the molten glass workable, and to produce a stable product.

"From the earliest times, these added ingredients were mainly soda and lime, with potash sometimes being substituted for soda, or used along with it."

Several fragments from glass made at Jamestown—unearthed near the site of the 1608-09 and 1621-24 furnaces—were analyzed, and contained quantities of potash (K_2O) varying from 3.8% to 5.4%. Harrington feels certain the potash was made at Jamestown:

"It [potash] would certainly have been produced locally, for wood products were critically scarce in England, and we recall that one of the products Captain John Smith set the men to make in the fall of 1608 was 'sope ashes.' As soon as the fires had been started in the furnace, there would have been plenty of suitable ashes. Potash was made by placing the ashes in pans of water and allowing the water to evaporate off, leaving a crude product with more or less impurities. The better the glass the more pains were taken in securing a pure form of potash. An even more common practice in making green glass was to use the ashes directly, omitting the leaching operation."

Therefore, as potash was used at Jamestown for making two important commodities—soap and glass—its importance to the early Jamestown economy should not be forgotten.

Soap ashes and potash were among the first commodities produced by the English in America. Potash was made from soap ashes (wood ashes, especially those obtained from burning ash and elm) and was used at Jamestown for making both soap and glass. Soap ashes were exported to England as early as 1608, and throughout the remainder of the century it appears both potash and soap ashes were shipped to the mother country.

As early as 1621 soap ashes were selling for 6 shillings to 8 shillings per hundred weight, whereas potash was bringing between 35 shillings and 40 shillings per

hundred weight. Although few contemporary records mention the profits made from the sale of soap ashes and potash by the Virginia planters, some small returns were made at various times throughout the seventeenth century.

While tobacco was the important money-making crop, the part played on the economy of the Jamestown settlement and environs by other commodities—including soap ashes and potash—should not be overlooked.

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- At Storrs Station, stands of Ladino Clover and total yields of forage were maintained much better by frequent applications of muriate of potash than by one large amount before seeding only.

- When such crops receive one large application of potash before seeding only, their supply of potash is soon exhausted by luxury consumption of potassium and the clover soon eliminated from the stand by potash starvation.

- At Storrs, the efficiency of the potash was increased by applying one-fourth of the annual application after each of the four cuttings per season.

By B. A. Brown

Storrs Experiment Station **University of Connecticut**

"PHOSPHORUS for establishment, potassium for maintenance."

At first glance, this terse adage seems to give broad and general guidance for the successful fertilization of forage legumes when they are growing under the same soil and climatic conditions.

Probably it will be construed by many as simply being liberal with superphosphate before seeding and potash afterwards. In the writer's experience, their position would be well taken.

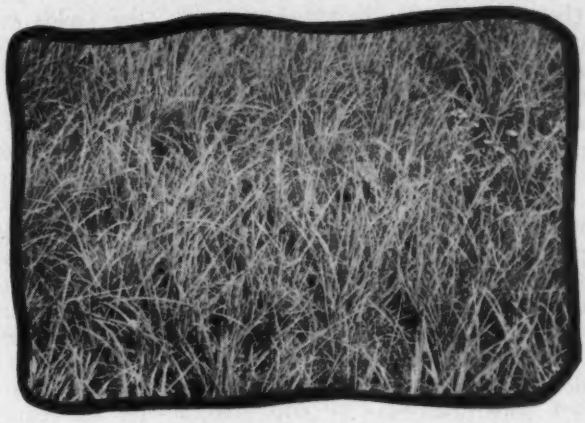
Mr. B. A. Brown has served as agronomist at the Storrs Agricultural Experiment Station in Connecticut nearly all of his professional life. A specialist in fertilization, he has taken several sabbatical leaves to the University of Wisconsin and has contributed numerous studies to professional journals.

As in numerous situations, *time* or *timing* is an important, frequently a vital factor. Timing is certainly important in supplying *sufficient potassium* for long-lived, productive stands of our forage legumes. It is especially so for Ladino clover on soils low in exchangable amounts of that plant nutrient element.

In support of the previous statement, some results will be given from a six-year experiment in supplying potassium for a 1949 seeding of Ladino and orchard grass. This seeding was made on the Agronomy Research Farm at the Storrs (Connecticut) Station. There the soil has the illite type of clay mineral and is classified as Paxton very fine sandy loam.

Before seeding only . . .

On this plot, 1,200 lbs of 60% KCl per acre were applied in 1949 and none thereafter. By 1954, when this picture was taken, the Ladino was nearly gone. And orchard grass, seen here, was the chief forage left on the plot.



Liberal amount yearly . . .

Here, from the same field as above, we have a plot that received 100 lbs of potash per acre *after every cutting*—or 200 lbs of K each year. By 1954, when this picture was taken, Ladino equals over 50% of the stand—the 5th harvest year.

15-year-old stand . . .

And here is a stand of Ladino 15 years old, probably the oldest stand east of the Mississippi. Two factors are responsible for its long, healthy life: (1) Liberal annual fertilization, especially with potash, (2) Mowing when 8" or 10" high to 2" above the ground.

The particular area had been growing unfertilized grass hay for 10 years; and previous to the experimental treatments, the soil was moderately acid (pH 5.7), "low" in available phosphorus (P), and "very low" in exchangable potassium (K).

In the rate and time of applying K part of the experiment, muriate of potash (60%) was added to triplicated 40 x 15-foot plots at widely varying times. The list of such treatments may be found in Table 1.

With all the variable K treatments, dolomitic limestone at two tons and 46% superphosphate at 600 pounds were applied before seeding. In addition, superphosphate (46%) was topdressed at 150 pounds after the second cutting each July.

The average annual stands of Ladino and the total yields of dry matter each year during the 1950-1955 period, for 11 widely varying rates and times of potash applications, are also given in Table 1. Those data show that where all (600 pounds K) of the K was added before seeding, the stands of clover and the yields of dry matter began to decline in 1952, the third harvest year, and continued decreasing, *relatively*, until in 1955 Ladino occupied only five per cent of the area and the yield of clover plus grass was about half that from the plots fertilized annually with one sixth of the same total amount of K.

The next treatment to be considered is the one in which K at 300 pounds was applied in 1949 before seeding and at 100 pounds each year in 1953, 1954, and 1955. In this case the prevalence of Ladino had declined about one third as early as the *second* harvest year. The yield did not diminish until the third season when the stand of clover averaged only six per cent or less than one fifth as much as where K was added annually. But both clover and yields began increasing in 1953 when annual fertilization with K was started. By 1955, the stands of Ladino and the yields were much improved *although they never reached the levels of the plots which had received K every year.*

Data from the annual versus four-times-per-season applications of K will be considered next. In this comparison, neither the stands of clover nor the yields differed as much as in the two cases previously discussed. In five of the six years, however, there was more clover where the K was added after each cutting and the yields were larger every year. For both factors the average differences for six years were approximately 10 per cent.

Results With Larger Amounts of K

So far, the discussion has been concerned with the *time* of application of K averaging 100 pounds per acre per year. Next we will consider the results when the annual rate was 150 pounds of K. There were four such treatments, each added once a season, but after a *different* cutting. These results are also given in Table 1.

First let's see if this higher rate increased stands and yields above those from the 100-pound dose when both were added in July after the second cutting. In this comparison, clover was more prevalent and dry matter production greater in *every* year for the higher rate. The average difference was approximately 20 per cent for each factor.

The cutting, after which the 150 pounds of K was applied, was less important. As may be seen the stands and yields were about the same for fertilization after the first or second harvest. Although somewhat erratic, in general, the results were not as satisfactory when the K was topdressed after the third or fourth cuttings. These inferior results might be due partly to the cooler weather in the fall and spring, when temperatures are not as favorable for legumes as they are for grasses.

A still higher rate—200 pounds of K per year—was also tried in this

Table 1—Ladino Stands and Total Yields as Influenced by Amounts and Times of Applying Muriate of Potash

K applied (lbs./acre)			Area occupied by Ladino (averages of 2 or 3 estimations per year)							Total Yields of Dry Matter (cwts. per acre)						
Plowed Under May '49	Disked in Aug. '49	Annually 1950 to 1955	1950 %	1951 %	1952 %	1953 %	1954 %	1955 %	Average 6 Years %	1950	1951	1952	1953	1954	1955	Average 6 Years
A. Treatments totalling 600 pounds K 1949-1955																
300	300	0	42	77	26	41	6	5	33	60	64	53	44	37	28	48
150	150	(1)	52	53	6	23	22	43	33	72	64	41	36	43	51	51
0	100	100 [2]	33	67	33	49	23	50	43	55	62	52	50	53	56	55
0	100	100 [3]	39	80	36	63	26	43	48	61	71	57	61	59	59	61
B. Treatments totalling 900 pounds K 1949-1955																
0	150	150 [4]	50	75	38	64	21	49	50	70	67	62	60	59	53	62
0	150	150 [2]	44	71	37	66	30	58	51	66	72	62	66	57	61	64
0	150	150 [5]	40	55	50	66	25	48	46	64	59	56	58	60	52	58
0	150	150 [6]	43	74	28	58	22	43	45	67	66	57	59	48	53	58
C. K treatments smaller and larger than in groups "A" or "B"																
0	200	200 [2]	53	79	42	67	30	61	55	68	74	65	64	56	53	63
0	100	200 [3]	33	71	32	58	25	51	45	61	70	61	60	60	56	61
0	50	50 [2]	36	64	23	40	21	21	34	57	56	44	40	40	38	46

[1] None in 1950, 1951, or 1952; 100 after second cutting in 1953, 1954, and 1955.
[2] After second cutting every year.
[3] One fourth of this amount after each cutting in all years.
[4] After *first* cutting every year.
[5] After *third* cutting every year.
[6] After *fourth* cutting every year.

experiment. That annual amount of K was applied once a season—after the second cutting—and also four times a year at 50 pounds after each harvest. These two treatments are not quite comparable since K was added at 200 pounds before seeding on the once-a-year plots, but at 100 pounds before seeding on the four-times-per-year areas.

When one compares the data from the entirely comparable 150- and 200-pound rates, there was slightly more clover from the more liberal dose, but the yields were practically the same.

Dividing the annual total of 200 pounds of K among the four cuttings encouraged less clover, but about the same production as the once-a-year application. Thus, it appears, with *the high and adequate annual rates of K,* it made little difference when it was applied.

It should be noted, however, that almost as much Ladino and dry matter was obtained from 100 pounds of K divided among four cuttings as from 150 pounds in one annual dose. Furthermore, analyses of part of the 1956 soil samples show that there was *definitely more exchangeable K* from the same total amounts of potash where it was added in smaller, *more frequent doses.* At least part of the greater efficiency of the smaller, more frequent applications was due to reductions in the luxury consumption of K. Analyses of the forage showed that much more uniform concentrations of K resulted from the smaller, frequent applications than from larger, less frequent ones.

Also, less K may have leached below the upper six inches of soil where smaller amounts of fertilizer were added frequently, but no data on this point are available. Anyway, the total recoveries of K in the forage and the residuals of K in the soil were increased by the *smaller frequent applications of muriate of potash.* It is pertinent also that the soil samples were not taken until 1956 or less than a year after the August and October flood-rains of 1955.

Liming and Luxury Consumption of K

In a pot experiment with the Paxton soil, the leachability of K was markedly reduced by moderate applications of dolomitic limestone. But, as shown in Table 2, the absorption of K by the clover and grass on the 600-pound-before-seeding plots was not reduced by limestone at four or eight tons per acre. And what is more important, the stands of clover and the yields of forage were not maintained much better under the very heavy, than with ordinary liming. It is concluded, therefore, that leaching *can* but luxury consumption of K

Table 2—K in Forage, Clover Stands and Total Yields as Affected by Very Heavy Liming

Limestone in 1949[1] (Tons per acre)	K in Dry Matter (%) (averages of all cuttings each season)				Stands of Ladino (%)				Total Yields of Dry Matter (cwts per acre)			
	1950	1951	1954	1955	1950	1951	1954	1955	1950	1951	1954	1955
2	3.3	2.9	1.5	1.4	42	77	6	5	60	64	37	28
4	3.4	2.8	1.4	1.5	54	77	6	6	72	71	36	27
8	3.4	2.7	1.5	1.6	48	76	18	19	73	64	48	43

[1] With all rates of limestone, K at 600 pounds per acre was applied before seeding in 1949 and none thereafter.

Table 3—Mg in Forage as Influenced by Supply of K

K Applied (lbs./acre)		Mg in Dry Matter (Average annual per cents)						
1949	Annually 1950-55	1950	1951	1952	1953	1954	1955	Average 6 Years
600	0	0.42	0.40	0.44	0.40	0.43	0.47	0.43
200	200[1]	0.43	0.38	0.34	0.28	0.37	0.31	0.34
150	150[1]	0.53	0.41	0.35	0.34	0.38	0.34	0.36
100	100[1]	0.43	0.51	0.35	0.37	0.45	0.34	0.40
50	50[1]	0.56	0.54	0.40	0.39	0.48	0.43	0.45
100	100[2]	0.53	0.42	0.33	0.37	0.40	0.30	0.36
100	200[2]	0.51	0.38	0.35	0.33	0.37	0.29	0.34

[1] Applied each July after second cutting.
[2] One fourth of these amounts applied after each of the four cuttings.

cannot be decreased by liming this soil.

Relation of K Fertilization to Chemical Composition of Forage

Samples of the forage from many of the plots were analyzed for nitrogen (N), phosphorus (P), calcium (Ca), and magnesium (Mg). Suffice it to say here that the N, P, and Ca concentrations in the clover-grass dry matter were not influenced much by K fertilization with one exception. That occurred where all of the K was added before seeding and none thereafter. As stated earlier, this treatment resulted in almost complete elimination of the clover in the fifth and sixth seasons. With little clover the orchard grass had insufficient N and this was reflected in appreciably lower N contents of the forage.

In contrast to P and Ca, the concentrations of Mg in the forage were affected by the various systems of adding K. In fact, the adequacy of the K fertilization might be estimated by the levels of Mg in the crop. A few examples are given in Table 3. These data show that the K-starved forage on the all-K-before-seeding plots contained relatively large amounts of Mg in 1952 and all subsequent years. The very low annual application of 50 pounds of K also resulted in high concentrations of Mg. With increasing annual amounts of K, the absorption of Mg decreased and the differences grew wider with the passing of the years and the building up of more exchangeable K in the soil by the high rates of K-carrying fertilizer. Thus, in the last year of the experiment (1955) there was a 50% variation in Mg between the most and least liberal applications of K. ◄◄◄

THE GOAL

"The goal of our agriculture is efficient production of ample kinds and quantities of food and fiber, with adequate provision for permanent productivity, and a fair return to farmers. Farmers should use fertilizers and every other cost-reducing, yield-increasing practice that pays off. They should increase efficiency in every way that is profitable and serviceable."

Ezra Taft Benson

REVIEWS

August-September, 1957

Recent publications of the United States Department of Agriculture, The State Experiment Stations, and Canada on Fertilizers, Soils, Crops, and Economics. A file of this department would provide a complete index covering all publications from these sources on the particular subject named.

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FOR BETTER SOILS

FERTILEGRAMS

FALL is the ideal time to fertilize lawns for a dense, green turf next year, according to Victor H. Ries, Ohio State University Extension Floriculturist. That should mean less crabgrass next year too. Weed growth slows down at this season and bluegrass is growing better after its midsummer dormancy. A dense stand of bluegrass tends to crowd out weeds.

Ries recommends 3 to 4 pounds of 4-12-8, 5-10-10, or 3-12-12 per 1,000 square feet. With stronger grades like 10-10-10 or 12-12-12, use only half that amount.

Every square inch of lawn should be covered. A lawn spreader will give even coverage. If the fertilizer is spread by hand, care must be taken to get it on evenly or there may be some burned spots.

Reseeding isn't necessary on established lawns unless there are bare spots larger than one foot in diameter. Fertilization will stimulate grass growth to fill in smaller bare spots.

Kentuckians gradually are moving to higher analysis fertilizers. In 1940, the average fertilizer had only 17 pounds of nutrients per hundred pounds; in 1956, it was 27 pounds.

When Range Conservationist Ralph Hughes of the Southeastern Forest and Range Experiment Station measured three-months growth of a pine seedling on experimental plots at Alapaha, Georgia, the pine with fertilizer had more than doubled its height.

The USDA specialist, stationed at Tifton, explains this is a new concept in forest experimentation. They have known for a long time that cultivation of seedling areas makes the pines grow faster—have test results showing this is a paying proposition. But there is very little information to date on the value of fertilizer—much less about what type fertilizer to use.

In these experiments they are trying the different combinations of phosphorus, potash, and nitrogen in amounts varying from zero to 200 pounds per acre of each nutrient. When the tests are complete, Hughes hopes to have many more answers on fertilizer for forest trees.

Placement of fertilizer and forage seeds in separate "bands" within the seedbed may prove to be the farmer's trump card in establishing a good pasture, say forage-crop specialists of the U. S. Department of Agriculture.

Results of experiments conducted since 1952 at the Agricultural Research Center, Beltsville, Md., indicate that the most effective method of forage-plant establishment was a combination of drilling fertilizer 1¼ inches deep and seed ¼ inch deep.

Several advantages of this new concept were revealed in comparative tests between broadcast and band-seeded plots of spring-planted orchardgrass with Sericea lespedeza, and fall-planted tall fescue with Ladino clover.

What appears to be a major breakthrough in man's continuing battle with destructive insects has been made by scientists at Kansas State College, Manhattan. The first insecticide which can be recommended as effective in control of the corn earworm in grain sorghum has been discovered by a staff member of the Kansas Agricultural Experiment Station, it was announced today.

The new insecticide, phosdrin, has been found to be highly effective in

FROM ACROSS THE LAND

FOR BETTER CROPS

tests conducted by station entomologists, with a performance record of 95 to 100 per cent.

Fruit trees, potatoes, celery, and alfalfa are among the crops which are first to show signs of potash deficiency in California, according to the California Fertilizer Association. In the Santa Maria area, blackening of the flesh of netted gem potatoes after cooking has been identified with potash deficiency. Experiments are now going forward there, and it has been found that very high rates of potash application have improved this discoloration problem.

In many instances, it's more profitable to add fertilizer according to soil test recommendations to land already in a farm than it is to buy additional acres, says O. T. Coleman, University of Missouri extension soils specialist.

Farm size should be determined on the basis of how much it produces rather than how many acres are in it. Most farmers can make their farms "bigger" by applying lime and fertilizer to supply nutrients needed for top yields.

Fertilizer and lime properly used usually offers the best means of getting the most profitable returns from a farm, Coleman says. And, a soil test is the best guide to correct use of fertilizer and lime.

A new test that gives a quick check of the ability of tree seeds to sprout has been developed at Oregon State College.

Called the hydrogen peroxide viability test, the new technique will make it possible to check the sprouting potential of tree seeds in 5 to 9 days. Standard germination tests take 8 to 12 weeks to run.

The quick test should be a boon to forestry and commercial nurseries in Oregon and across the nation, giving them a quick check on tree seed they're planning to buy or sell, according to Mrs. Louisa Jensen, seed analyst in charge of the cooperative seed testing laboratory at OSC. Cost of the new test will be $3.50 to $5 a sample.

In the viability test, ends of tree seeds are sandpapered or clipped off. The seeds are then placed in a weak hydrogen peroxide solution and kept in a germination cabinet for 5 to 9 days. At the end of this period, viable seeds show signs of growth from the clipped end.

OHIO farmers may give their permanent pastures, established meadows and new seedlings a boost next spring by topdressing them now with phosphorous and potash.

Fall fertilization of grasses and legumes has some distinct advantages over spring treatment, according to E. P. Reed, Extension Agronomist of Ohio State University. When the plant food is applied in the fall it is there ready to go to work as soon as warm weather arrives in the spring. Also, farmers generally have more time in the fall, and the ground usually is such that the spreader can get a firm footing.

Reed points out fall also is a good time to build up plant-food reserves for row crops which follow meadows and pastures in the rotation. The analysis of the fertilizer should be determined by soil test. Many farmers use 0-20-20 on alfalfa and brome. For new seedings the rate of application would depend on what treatment was given the preceding small grain crop. For example, where wheat has received 300 or 400 pounds to the acre, an application of 200 or 250 pounds would be sufficient for hay, Reed explains.

Why are there so many more bald men than women? A brave man scientist, Dr. Young of Howard University, argues that it is because men's brains keep growing while women have smaller brains and more fat in their heads. That fellow is in for trouble.

• • •

The freshman was describing the wonderful show that the band put on between halves of the football game. "And the baton was twirled by Betty Jane with both ends aflame?"

"Was she badly burned?"

• • •

Her—I think dancing makes a girl's feet big, don't you?

Him—Yeah.

Her—I think swimming gives a girl awfully large shoulders, don't you?

Him—Yeah.

(Pause)

Him—You must ride quite a bit, too.

• • •

An elderly couple asked for a room at one of the leading hotels in a large city. The clerk advised them that the only thing he had left was the bridal suite. The elderly gentleman replied, "Well, we do not want the bridal suite. We have been married for fifty years." And the clerk chirped back, "Just because you go to a night club for dinner you don't have to dance."

Shoes without toes are all right. And the ladies look O.K. without nylons on their legs. I even approve of dresses without backs. But not of slacks without any slack.

• • •

Overheard in an income tax office:

"I don't understand this, lady. You say you've had four children by two different husbands, but you claim five dependents."

"That's right. Two by my first husband, two by my second, and one by myself."

• • •

My Uncle was wrecked on a desert island with twenty-five beautiful girls and when they found him he was nearly dead!"

"From exposure?"

"No—from pulling down the distress signals the girls put up."

• • •

"I see befo' me," said the colored preacher on Easter Sunday, "twelve chicken stealers, includin' Kentucky Joe." After the morning service Joe made it clear to the parson that the slanderous statement must be withdrawn if the preacher's nose was to remain intact. At the evening service the preacher rose to the occasion, "Now I see befo' me," he declared, "nine chicken stealers, not includin' Kentucky Joe."

PUNCH FOR THE MONTH: There were fewer wrecks in the horse-and-buggy days because the driver didn't depend wholly on his own intelligence.

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